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Construct Development for the FocaL Adult Gambling Screen (FLAGS): A Risk Measurement for Gambling Harm and Problem Gambling Associated with Electronic Gambling Machines

Tony Schellinck,[1,2] Tracy Schrans,[2] Heather Schellinck,[1] & Michael Bliemel[1]

[1] Dalhousie University, Halifax, Nova Scotia, Canada.
[2] Focal Research Consultants Limited, Halifax, Nova Scotia, Canada.

Abstract

This is the first of two papers describing the development of the FocaL Adult Gambling Screen for Electronic Gambling Machine players (FLAGS-EGM). FLAGS-EGM is a measurement approach for identifying gambling risk, a tool that incorporates separate reflective and formative constructs into a single instrument. A set of statements was developed that captured ten constructs associated with gambling risk or which were considered components of problem gambling. Following completion of focus groups with regular slot players, a survey with the reduced set of statements was then administered to a sample of 374 casino slot players in Ontario, Canada. Nine of the proposed constructs passed tests for reliability and validity (Risky Cognitions Beliefs, Risky Cognitions Motives, Preoccupation Desire, Risky Practices Earlier, Risky Practices Later, Impaired Control Continue a Session, Impaired Control Begin a Session, Negative Consequences, and Persistence). A tenth construct (Preoccupation Obsession) requires further development through the addition of improved statements.

Résumé

Voici le premier de deux articles décrivant la mise au point d'un instrument appelé le *FocaL Adult Gambling Screen for Electronic Gambling Machine players* (FLAGS-EGM). Il s'agit d'une méthode d'évaluation du risque de dépendance au jeu qui réunit deux volets distincts en un seul instrument, l'un réflexif et l'autre formatif. Nous avons formulé un ensemble d'énoncés traduisant dix constructs associés au risque ou considérés comme des éléments constitutifs des problèmes de jeu. Après avoir mené des groupes de discussion avec des joueurs qui s'adonnent régulièrement aux machines à sous, un questionnaire formulé à partir d'un ensemble limité d'énoncés a été administré à 374 joueurs en Ontario (Canada). Neuf constructs

sur dix ont réussi les tests de fiabilité et de validité (croyances cognitives risquées, motivations cognitives risquées, préoccupation relative au désir, pratiques risquées antécédentes, manque de contrôle–continue la séance, manque de contrôle–entame une séance, pratiques risquées ultérieures, conséquences négatives et persistence). Un dixième construct (préoccupation relative à l'obsession) nécessitera une mise au point grâce à l'ajout d'énoncés améliorés.

Introduction

With the current emphasis on preventing gamblers from self-harm prior to the development of gambling problems, an instrument that clearly identifies those at risk is urgently required. Originally a number of screens, such as the South Oaks Gambling Screen (SOGS) (Lesieur & Blume, 1987, 1993) and the DSM-IV-TR (4th ed., text rev.; DSM–IV–TR; American Psychiatric Association, 2000), were designed to identify problem gamblers among treatment populations. Debate surrounding the identification of pathological versus problem gamblers and the utility of the existing gambling screens for general population use (Dickerson, 1993; Lesieur & Blume, 1993; Volberg, Dickerson, Ladouceur, & Abbott, 1996; Walker & Dickerson, 1996) led to the development of other measures, including the National Opinion Research Center DSM–IV-based Screen for Gambling Problems (NODS) (Gerstein et al., 1999), the Canadian Problem Gambling Index (Ferris & Wynne, 2001), the Victoria Gambling Screen (Tolchard & Battersby 2010), the Gamblers Beliefs Questionnaire (Steenbergh, Meyers, May, & Whelan, 2002) and the Gambling Related Cognitions Scale, developed by Raylu and Oei (2004). Several of these newer screens also included risk estimates as a component of identifying problem gambling, yet none of the screens incorporated the use of unique constructs specifically to identify gambling risk as a component separate from problem gambling.

Presently, the Problem Gambling Severity Index (PGSI) component of the Canadian Problem Gambling Index appears to be used most often to assess risk as a component of identifying problem gambling severity. With this instrument, a score of 0 is labelled "no risk," scores of 1–2 are labelled "low risk," 3–7 are labelled "moderate risk," and individuals scoring 8 or higher are classified as problem gamblers (Ferris & Wynne, 2001). As such, the PGSI views risk as part of a single concept, and includes classification criteria for two risk categories. It assumes that risk is captured as a lower score whereas higher scores represent problem gambling. Although no evidence exists to suggest that (1) lower scores reflect lower risk as opposed to lower certainty that someone is a problem gambler, or (2) the severity of the problem gambling is indeed lower, it nevertheless seems likely that some at-risk gamblers are in fact identified through this instrument. Nonetheless, no published research has demonstrated that the PGSI or any other instrument that identifies or categorizes gamblers actually predicts risk due to problem gambling.

Currie, Hodgins, and Casey (2013) compared the characteristics of gamblers in the four PGSI categories, on variables previous research had found were associated with pathological gambling, to determine if there were significant differences among the gamblers in each category. The reason for doing so was as follows: if the gamblers were significantly different on these dimensions, then the gamblers could in turn be considered as belonging in valid and distinct groups. Currie et al. found not only that the no-risk group was distinctively different from the low- and moderate-risk groups, as well as the problem gambling groups, but also that few differences existed between the low- and moderate-risk groups. This finding suggests the PGSI low- and moderate- risk groups do not in fact comprise distinct categories of gamblers. Currie et al. did improve the distinctiveness of the low and moderate risk groups by redefining the PGSI score thresholds (from 1–3 for low risk to 1–4) but this modification did not deal with the fact that the PGSI design, by relying on a continuum, has consequent limitations. This problem suggests in turn the need for an instrument that is better able to form distinct groups of gamblers with differing risk profiles.

Thomas, Jackson, and Blaszczynski (2003) have emphasized the need for a tool to independently determine risk as distinctive from problem or pathological gambling. Shaffer, LaBrie, LaPlante, Nelson, and Stanton (2004) also pointed out the pressing need to investigate risk and protective factors that influence the onset of gambling disorders. Given the limitations of existing problem gambling screens in identifying risk, the FocaL Adult Gambling Screen (FLAGS-EGM) was developed specifically to address this measurement gap. Our instrument is designed to work similarly to screens the medical community has established to identify factors for specific high-risk conditions (e.g., Naghavi, Falk, Hecht, & Shah, 2006).

Using item response theory and statistical modeling, with the detailed play behaviour and attitudinal data gathered for regular machine gamblers during the 1998 Nova Scotia Video Lottery Players Study, Schellinck and Schrans (1998) developed the first hierarchical model of the antecedents of problem gambling for EGMs. Three principal considerations underlay underlied the creation of FLAGS-EGM:

1. The ability to identify independently, gambling risk prior to the development of harm and problem gambling;
2. The suitability of the instrument for multiple use including self-assessment, prevalence, social policy and responsible gambling evaluation and public health surveillance; and
3. The sensitivity of the instrument such that it (1) identified accurately changes in risk and problem gambling levels over time, and (2) provided insight sufficient to inform action by both individual and policy makers. Such insight was to be indicated through erroneous beliefs, inappropriate motives, and risky behaviours, all as exhibited by gamblers themselves. It was also to be indicated through the nature of the harms being experienced, and through the existence of impaired control and preoccupation among the gambling population.

Operationally Defining Gambling Harm and Problems

As the first step in achieving these objectives, an operational definition for gambling harm and problem gambling, as well as of risk, was in all three cases required. In 1994, the American Psychiatric Association (APA) defined pathological gambling as the "persistent and recurrent maladaptive gambling behaviour that disrupts personal, family and vocational pursuits" (4th ed., text rev.; DSM–IV–TR; APA, 2000). Individuals so defined are preoccupied with gambling, may be unable to control their gambling, and both chase losses and suffer negative consequences as a result of these problems. Many subsequent definitions of problem and pathological gambling have been advanced. Most of these definitions have concerned themselves in particular with continued excessive involvement in gambling despite associated negative consequences for the individual. More recently they have also dealt with negative outcomes for the gambler's family, community or society at large (Neal, Delfabbro, & O'Neil, 2005). These authors also noted the need for an instrument that would differentiate definitively among individuals at different levels of risk.

We have operationally defined problem gambling as the co-occurrence of two conditions composed of "negative consequences" (outcomes) and "persistence" (behaviour). Problem gamblers are characterized as those persons who have experienced negative consequences directly related to gambling in the past 12 months and who persist in gambling despite the occurrence of these negative consequences. Other characteristics such as those noted in the DSM-IV (4th ed., text rev.; DSM–IV–TR; APA, 2000), such as loss of control, chasing losses, and preoccupation, are conceptualized as risk factors leading to problem gambling, and are used in the FLAGS-EGM model as precursors to gambling harm and problem gambling. A key objective of the FLAGS-EGM measure is the development of constructs to capture fully the dimensions of risk, harm and problem gambling.

Using Reflective and Formative Constructs to Develop the Instrument

In creating this instrument, we included both reflective and formative constructs. Previously, researchers have developed and assessed most gambling screens based only upon reflective constructs. Reflective constructs presuppose that an underlying latent construct causes the observed variation in the measures (Nunnally, 1978). As items within a reflective construct are all indicative of the underlying latent variable, high correlation among the items comprisingthe measure should result: in theory, a gambler should endorse either all or none of the items being flagged through the construct. This method is a highly desirable for conceptualizing and measuring a single homogeneous factor, or specific concept, such as preoccupation or persistence. Either an individual meets the conditions for identification on this dimension or that person does not. For example, a construct such as impaired control is best designed as a reflective construct. It is designed this way to capture the specific nature of a gambler's tendency to find it difficult to stop gambling once engaged in play.

In practice, those researchers developing or interpreting problem gambling screens may assume that the number of items endorsed for a reflective construct represents a

continuum. It is, however, incorrect to presuppose that the higher the number of items selected, the greater the impact or severity. Indeed, research in the area of construct development has challenged assumptions that constructs should always be reflective (Diamantopolos & Siguaw, 2006; MacKenzie, Podsakoff, & Jarvis, 2005), and the relative merits of using reflective and formative measures for theory development are still being debated. General consensus argues that formative measures are suitable for prediction of given outcomes when used with structural equation modeling (SEM) (Diamantopoulos, Riefler, & Roth, 2008; Diamontaopoulos & Sigaw, 2006; Freeze & Raschke, 2007; Howell, Breivik, & Wilcox, 2007; Wilcox, Howell, & Breivik, 2008).

In contrast to a reflective measure, a formative construct is said to predict the latent variable (Bollen & Lennox, 1991; Gefen, Straub, & Boudreau, 2000). The items comprising formative constructs represent different, often uncorrelated dimensions of the latent variable. Endorsement is additive such that the more items endorsed the greater the severity of impact. This characteristic is a desirable one for an instrument intended to identify levels of risk or harm: the more harm components an individual endorses, the greater the severity of gambling problems, or, in the case of risk components, the higher one's risk for problem gambling. To represent adequately the scope of a variable, such as risky beliefs, would require a formative construct that included various diverse concepts. Examples of those concepts include beliefs that game outcomes could be influenced, that chances of winning improved with continued play, or that outcomes could be predicted. These beliefs may not all be held by the same persons but all are associated with risk.

A problem may arise when a screen is used as a multi-purpose measure to assess more than one dimension of gambling, e.g., problem gambling and an individual's risk for developing problem gambling. Although characteristics of risk for becoming a problem gambler and the characteristics of being a problem gambler are not necessarily the same, the items retained in most instruments are all highly correlated with each other. As a result, those gamblers who are at various stages of risk may be undetected or misclassified. To resolve this problem, we included separate constructs to measure individual risk elements.

The analyses undertaken to develop and test each of the constructs for the FLAGS-EGM instrument was extensive and exceeded the scope of this paper. Consequently, we have divided the work into two parts: this paper describes the first phase of the instrument design process, including (1) selection of the constructs, (2) a description of the statement process, followed by the assignment of the statement to the constructs, and (3) testing of the constructs' validity and reliability. A companion paper describes the development of the FLAGS-EGM instrument, using Partial Least Squares (PLS) modeling to establish relationships among the constructs in a path leading to problem gambling. The results of the PLS analysis in the second paper have implications for the design and testing of the constructs we refer to in the current article and the reader should consult that publication for further information.

Construct Design for FLAGS-EGM

Many of the general characteristics associated with problem gambling have already been thoroughly described (Johansson, Grant, Kim, Odlaug, & Götestam, 2009; Turner, Jain, Spence, & Zangeneh, 2008). To avoid the possibility of creating false positives and to limit, in the development of our instrument, the size of FLAGS-EGM, we included only gambling-specific constructs, each comprised of statements that referred to the respondent's gambling cognitions, behaviours or experiences. Based upon our original research in this area (Schellinck & Schrans, 1998) and a comprehensive literature review, we created the reflective and formative constructs described below.

Reflective Constructs

Preoccupation Obsession. An individual who is preoccupied with thoughts of gambling has been defined as "having a fixation on gambling, is continually reliving past experiences, planning the next outing and thinking about how to get money for such an excursion" (4th ed., text rev.; DSM–IV–TR; APA, 2000). These criteria have been found to be reliable and valid predictors of problem gambling (Hodgins, 2004; Lakey, Goodie, Lance, Stinchfield, & Winters, 2007; Stinchfield, Govoni, & Frisch, 2005; Toce-Gerstein, Gerstein, & Volberg, 2009; Wickwire, Burke, Brown, Parker, & May, 2008). Gamblers who are obsessed with their play think constantly about their gambling. This fact in itself may not be considered a negative consequence of gambling; however, these thoughts can become so prevalent that they are deemed harmful, insofar as the person is tormented by these thoughts, is unable to function normally, or both. In these circumstances, gambling is seen to have harmed the gambler.

Preoccupation Desire. Merely whiling away one's time with thoughts of gambling (Preoccupation Desire) is considered a risk indicator that occurs in the absence of harm. We have defined Preoccupation Desire as "having a strong desire to gamble frequently or as often as possible"; other researchers have referred to this characteristic as "craving" (Ashrafioun & Rosenberg, 2012; Young & Wohl, 2009). Wanting to gamble frequently may be a common characteristic of everyone who enjoys gambling; however, a strong desire that leads to increased or more extreme gambling activity could be an effective indicator of elevated risk. This characteristic could also be particularly relevant in subsequent modeling analysis, if it is shown to be a precursor to Impaired Control and Risky Practices.

Impaired Control Begin and Impaired Control Continue. Impaired control has been characterized as "repeated unsuccessful attempts to resist the urge to gamble in the context of genuine desire to cease" (Blaszczynski & Nower, 2002) as well as an inability to resist opportunities to gamble (e.g., begin a session) and cease the activity once engaged (e.g., continue a session) (Dickerson & O'Connor, 2006). We operationally defined the reflective construct, Impaired Control, as a gambling-specific construct based upon an individual's personal experience.

Impaired control has been considered a cause of problem gambling (Ladouceur, Cantinotti, & Tavares, 2007) and thus has the potential as a risk indicator. Gamblers

may attempt to justify their losses by perceiving them as a product of a lack of control, whether or not this is actually the case (Dickerson & O'Connor, 2006). Regardless of whether the action is perceived or factual, if a gambler recognizes that he is acting contrary to his intentions, this perception may be an indicator of risk. In creating our construct we modified several statements from the Scale of Gambling Choices (Baron, Dickerson, & Blaszczynski, 1995). We also used the two behaviours described by Dickerson and O'Connor (2006). In doing so we considered impaired control to be a two-dimensional construct such that an individual could suffer from one or both of the following problems: (1) Impaired Control Continue a session, defined as an inability to cease gambling once engaged, or (2) Impaired Control Begin a session, defined as an inability to resist starting a session .

Persistence. Persistence is generally referred to as playing for a long time within a session, particularly when losing (Dickerson, 1993), and as excessive play in addition to continuing to play in attempts to recover previous losses (Breen & Zuckerman, 1999). The term has also been used in the context of assessing the number of trials at play (Kassinove, 1999) or sessions gambled per month (Ladouceur & Sévigny, 2005). Whether or not the player suffers harm from playing over an extended period of time is not generally addressed. Given our interest in using the concept of persistence to characterize problem gambling, we defined the reflective construct as the engagement of risky practices over an extended period despite that behaviour leading to negative consequences. We did not include "chasing losses" in our Negative Consequences construct, and instead positioned it as an element of the formative construct Risky Practices, where it could serve as a risk indicator or precursor to negative outcomes.

Formative Constructs. Formative constructs are basically lists of items that as exhaustively as possible capture and thus define the latent variable being measured. A principal goal of this literature review was to identify a broad range of items and, subsequently, to select those items that defined unique elements of the construct. Thus, each item retained could contribute to the identification of individuals who have indications of the latent variable.

Risky Cognitions Beliefs. Many gamblers believe irrationally they can use skill to influence the outcome of games that have completely random results. For example, certain gamblers may think that pressing the buttons quickly on a gambling machine will increase their odds of winning. Moreover, many players mistakenly believe that the probability of winning is greater than is actually the case. This "illusion of control" concept advanced by Ladouceur and Walker (1996) and further defined by Toneatto (1999) provided the background for many of the scales developed to investigate the role of erroneous cognition in maintaining problem gambling. The PGSI includes two statements regarding faulty cognitions (Ferris & Wynne, 2001), and items assessing similar concepts have been used to discriminate successfully between pathological/problem and non-pathological/non-problem gamblers (Källmén, Andersson, & Andren, 2008; Raylu & Oei, 2004; Steenbergh et al., 2002; van Holtz, van den Brink, Veltman, & Goudriann, 2010; Xian, Shah, Phillips, Scherrer, Volberg, & Eisen, 2008). We created the formative construct Risky

Cognitions Beliefs. The construct comprises belief statements consistently found in the literature as being associated with risk for electronic gambling.

Risky Cognitions Motives. An individual's motivation is considered to be a reflection of the internal and external forces that direct him to take action. For example, a person could be internally motivated to gamble for the feeling of excitement or externally motivated to gamble to win money (Lee, Chae, Lee, & Kim, 2007). The Motivation Towards Gambling Scale incorporated the following motivations: reward seeking; self-imposed pressures, such as the need for recognition; and goals, such as socialization, knowledge, accomplishment and stimulation (Chantal, Vallerand, & Vallières, 1995). Subsequent work by Clarke (2004, 2005, 2008) and Pantalon, Maciejewski, Desai, and Potenza (2008) confirmed the role of these factors in shaping play behaviours. The motivation "to escape one's problems" is also highly correlated with both frequency of gambling and progression towards pathological gambling (Clarke, 2008; Nelson, Gebauer, Labrie, & Shaffer, 2009; Nower & Blaszczynski, 2010; Thomas, Allen, & Phillips, 2009). Our construct Risky Cognitions Motives only contains those factors found to be associated with problem gambling and does not include all the motivators for gambling described in the literature.

Risky Practices (Earlier and Later). Problem gamblers have been found to engage in behaviours such as chasing losses, and participating in illegal activities to finance gambling and lying about the extent of their gambling (4th ed., text rev.; DSM–IV–TR; APA, 2000). Such risky practices may also occur during play. For example, an individual may attempt to borrow money from another player (Schellinck & Schrans, 1998). As playing behaviour begins to cause problems, gamblers engage in a variety of risky practices that may escalate in severity (Campbell-Meiklejohn, Woolrich, Passingham, & Rogers, 2008; Hong, Sacco, & Cunningham-Williams, 2009; Sumitra & Miller, 2005). Fewer gamblers tend to engage in the more risky practices (Schellinck & Schrans, 1998; Schellinck, Schrans, & Walsh, 2000). Although players may frequently use maximum bet options, or use a bank card to obtain additional cash during a session of play, they less commonly borrow money on their credit cards to keep playing. If the endorsement rates varied substantially among the risky behaviours analysed, we would consider creating two formative constructs, "Risky Practices Earlier" and "Risky Practices Later."

Negative Consequences. Several problem gambling screens (Ferris & Wynne, 2001; Lesieur & Blume, 1987; Toce-Gerstein et al., 2009) include statements regarding harmful outcomes. Our measure included characteristics described by Thomas et al. (2009), such as negative impacts on work and financial well-being, problems with health, interpersonal relationships, and deceptive behaviour. We also incorporated statements assessing the impact on the individual's sense of self-worth as described by Suurvali, Cordingley, Hodgins, and Cunningham (2009), in this formative construct. We have excluded more extreme consequences, such as engaging in criminal behaviours and having suicidal tendencies, as these questions were considered to be too threatening for a self-administered survey. As well, the less

severe consequences would be experienced first so the instrument's ability to identify problem gamblers would not be compromised by their exclusion.

Method

Survey Development

We selected 190 prototype statements for assessment in the constructs. Each item selected for testing was hypothesized to be associated with gambling risk or harm as variously supported by the literature, the OPGRC risk framework (Simpson, Goodstadt, Wynne, & Williams, 2008) and our own research examining determinants of problem gambling (Schellinck & Schrans, 1998; Schellinck et al., 2000). The instrument was evaluated in a two phase process with regular slot machine gamblers. First, six qualitative focus groups (n=63) were completed to conduct a beta-test of the items. Second, based upon the outcome of the focus groups, a quantitative telephone survey (n=374) with a reduced instrument was completed. The research was subject to independent ethics approval by the Institutional Review Board Services.

Participants

Regular slot machine gamblers, i.e., those gamblers who on average played once a month or more over the past 12 months, were approached at the Slots at Western Fair in London Ontario over a one-week period ($n \approx 650$), prescreened and invited to join a confidential research panel. The original panel sample was generated through on-site recruitment over a five-day period including three weekdays (Tuesday, Wednesday and Thursday) and the weekend (Saturday and Sunday) over day and evening shifts covering periods from 8 a.m. to 10 p.m. Whereas the resulting sample constituted a convenience sample it was nonetheless fairly representative of the population of frequent gamblers, with high cooperation rates during the recruiting process (refusal rates $< 20\%$).

Participants—Qualitative Assessment. Panel members were then re-contacted to take part in a series of focus groups to assess a beta version of the instrument. We did this to assist in determining the clarity of the items. Participants were recruited and grouped depending upon their risk score on the PGSI, (i.e., 0, 1– 4, or 5 or more) and how long they had been gambling on a regular basis of once a month or more (less than 2 years, or 2 or more years). An equal number of men and women took part in the sessions, with ages ranging from 23 to 74 years. All participants arrived 30 minutes before the session to self-complete a beta version of the instrument. During the discussion that followed, participants referred to a blank copy of the items to preserve the confidentiality of their personal responses. All sessions were audiotaped and the tapes transcribed by independent support personnel. An independent observer kept detailed notes during the sessions for use in thematic analysis of the statements. The discussion groups lasted approximately two hours and participants received an honorarium of $60.00 for taking part in the sessions.

If the participants had several interpretations of the wording, the statements were either revised or discarded as unsuitable. Many of the statements were intentionally similar in wording; those examples found to align most closely to our original intended meaning were retained, with less definitive versions eliminated. Based upon group responses and subsequent assessment of the 63 surveys, 132 dichotomous response statements were generated for testing in a larger quantitative sample.

Participants—Quantitative Evaluation. The remaining panel members were contacted by telephone and asked to complete the reduced instrument. Informed consent was obtained from respondents before data collection took place. Individuals currently receiving assistance for substance use, gambling, or a mental health issue were excluded, as were those persons who worked for (1) the media, (2) a political or lobby group, (3) Addiction Services, or (4) Ontario Lottery Gaming or an affiliate. Participants who wished to do so had their names entered into a draw for one of four $100 grocery gift certificates (with no cash value) at a retail grocer of their choice. Of 422 eligible panel members, 374 met the selection criteria, i.e., played slots more than once a month, were not a member of any of the excluded groups, and responded to the survey. This process resulted in a completion rate of 69.2 %. Prior to analyses, 18% of those persons who responded to the survey were re-contacted by the field staff supervisor and key questions were repeated to ensure consistency and accuracy in responses to the survey. This process ensured that (1) the respondents were answering honestly and that they were not having problems remembering key estimates, and (2) that the interviewers were administering the survey correctly. No surveys needed to be deleted upon completion of this process.

This sample was comprised of 150 males and 224 females; the median age was 63 with ages ranging from 23 to 89 years. Over half (53.5%) of the sample played the slots weekly, 0.8% played daily and 45.7% played less than weekly on the slots. According to the PGSI 54.8% of the respondents were no risk gamblers, 19.3% were low risk gamblers, 20.3% were medium risk gamblers and 5.6% were problem gamblers. The test instrument and classification questions took approximately 26 minutes to administer (range 20–46). Statements were randomized for each participant to reduce the risk of common method bias (Bliemel & Hassanein, 2007).

Data Analysis and Results

Statement Selection Criteria

Following analysis, the 132 statements were reduced to 53 items across the 10 constructs (see Appendix). As described below, the criteria for selecting the statements for the proposed constructs differed depending on whether the constructs were reflective or formative. Three steps were used to select the statements for the reflective constructs. First, exploratory principal components analysis (PCA) was performed on the three sets of statements designed to measure the original constructs—impaired control, preoccupation and persistence. Those statements having loadings greater than 0.5 on the resulting varimax rotated constructs were retained (Table 1). Second, statements comprising the resulting five constructs that

Table 1
Selection Criteria and Descriptive Statistics for the Reflective Constructs

FLAGS-EGM Reflective Construct and Statements	Component Loading	Frequency Endorsed	Freq. Rank
Preoccupation Desire			
Pre-des 1: If I could play the machines all the time I would.	0.83	26.2%	22
Pre-des2: I wish I could gamble on the slots more often.	0.80	28.9%	17
Pre-des3: I like to play the slot machines every chance I get.	0.77	29.1%	16
Pre-des4: I would like to play the slots almost every day.	0.74	20.3%	41
Preoccupation Obsession			
Pre-obs1: I sometimes dream about playing the slot machines.	0.78	8.0%	83
Pre-obs2: I spend more time than I used to thinking about playing the slots.	0.70	9.4%	76
Impaired Control Continue a Session			
IC-cont1: I often spend more money gambling than I intended.	0.86	24.3%	27
IC-cont2: Even when I intend to spend a few dollars gambling, I often end up spending much more.	0.85	25.9%	23
IC-cont3: I sometimes gamble with money that I can't really afford to lose.	0.78	21.4%	38
IC-cont4: Once I have started gambling on the slots I find it very hard to stop.	0.74	24.1%	29
IC-cont5: I often spend more time gambling than I intend to.	0.71	24.1%	28
Impaired Control Begin a Session			
IC-begin1: I have tried to cut back on my slots play with little success.	0.87	9.1%	77
IC-begin2: I have tried unsuccessfully to stop or reduce my gambling on the slots.	0.85	8.0%	84
IC-begin3: There have been times I have gambled despite my desire not to.	0.74	15.0%	57
Persistence			
Persist1: I continue to play the machines despite experiencing problems or other negative consequences.	0.88	10.2%	72
Persist2: I continue to gamble despite the bad things that happen to me.	0.85	10.2%	73
Persist3: Even if money is tight, I continue to play the slots to get big wins.	0.80	8.0%	86
Persist4: I gamble even though I know it is likely to lead to problems for me.	0.79	11.8%	67

had substantially different endorsement rates from the mode endorsement rate for each construct were dropped. Third, if a construct still had more than five statements those statements with the lowest loadings on the component were dropped so that the maximum number of statements in a construct to be tested for reliability and validity was five.

The formative construct statement selection process itself had three steps. First, PCA analysis of those statements designed for a construct was conducted, though for formative constructs it was expected that many components would be formed, and

that one or two statements would be selected from each component to ensure all dimensions in the construct were captured. Second, the degree in overlap among the statements was then tested for by examining the Variance Inflation Factor (VIF) score of the statements when tested together, and statements with too much overlap with the other statements (i.e., VIF $>$ 10.0) were dropped. Third, endorsement rates within the risky practices construct were compared to determine if certain statements might indicate earlier or later levels of risk. The large disparity in endorsement rates (4.0% – 34.8%) led to the splitting of the construct into two (one indicating early risky practices, the other later risky practices).

Reflective Construct Statement Selection Criteria

The statements created for each reflective construct were expected to reflect a single underlying latent variable. Several criteria, outlined below, were used to decide which statements would be assigned to the reflective constructs, which statements would be dropped, and whether any statements might need modification of wording to capture better the latent variable being measured.

1. Exploratory PCA was first conducted on the responses to the 132 dichotomous response statements, with the expectation that the statements designed for a particular reflective construct would load highly on the same component. A separate analysis was conducted in each set of those statements designed to measure one of the three original constructs—impaired control, preoccupation and persistence. Following varimax rotation of components with eigenvalues greater than 1, the items that had loadings of at least 0.50 were retained in the construct. The loadings for the retained statements are reported in Table 1. Using this method, the loadings could differ an average of 0.07 to 0.08 from tetrachoric correlations—that is, those correlations derived using specialized programs designed specifically for dichotomous data (Maguire, 2001). As we used this analysis to choose items for further testing, we considered this level of accuracy to be acceptable. Both the impaired control and preoccupation statements formed two components as predicted by the literature. The statements in the two resulting impaired control components dealt with, first, an inability to cease play once started (Impaired Control Continue) and, second, an inability to resist starting new gambling sessions (Impaired Control Begin). The statements designed to measure preoccupation also formed two components, those that indicated a strong desire to gamble more often (Preoccupation Desire) and those that indicated an overwhelming obsession with gambling (Preoccupation Obsession). Though we started with three original constructs the outcome of conducting the PCA analysis was the creation of five reflective constructs that confirmed what was indicated in the literature.
2. For reflective constructs, each item selected should have, if it is measuring the same underlying latent variable, a similar rate of endorsement by gamblers (Diamantopoulos & Winklhofer, 2001; Jarvis, MacKenzie, & Podsakoff, 2003; MacKenzie, 2003). No clearly defined criteria exist in this context, but we

dropped statements if their endorsement rates differed by more than 10% from the mode endorsement rate for statements in a single reflective construct.
3. For each reflective construct, among those with a minimum loading of 0.70, the five highest loading statements were chosen prior to testing the variables for reliability and validity. A minimum of three statements was required for reliability testing. The maximum number of items selected per reflective construct was five; we chose this limit to minimize the total number of items in the instrument. At the end of this selection process, one reflective construct only had two statements that loaded 0.70 or more on the component (Preoccupation Obsession), one had three statements (Impaired Control Begin), two had four statements (Preoccupation Desire, Persistence), and one had five statements (Impaired Control Continue) (see Table 1).

Formative Construct Statement Selection Criteria

1. Principal component analysis of the 132 statements was also used to help select statements to be included in the formative constructs (Table 2). Components with eigenvalues greater than one were selected and rotated using varimax rotation. A number of principal components were formed that contained the statements intended to compose the formative constructs. For example, five components were formed from the eleven statements tested for inclusion in the Risky Cognitions Beliefs construct. We selected the highest loading statement from each component for inclusion in this construct, resulting in five statements capturing five distinctive belief components. Sometimes a statement intended for a formative construct did not load strongly on any component, i.e., no loading higher than 0.70, indicating relative independence from all other statements in the set. This item was retained in the statements used to form the intended formative construct, as it may have been measuring a unique characteristic in the construct itself. In a few instances, particularly for the Negative Consequences construct, we retained specific statements even though they loaded above 0.70 on a component with another retained statement. We did this when the items appeared to capture consequences that were different but which tended to happen to the same people at such a rate that the items would load on the same component. If subsequent testing using the Variation Inflation Factor (VIF) scores indicated there was too much overlap in the responses to the questions, we removed one of the items.
2. For each formative construct, the statements were required to have a VIF of less than 10.0 (Diamantopoulos & Siguaw, 2006). Each set of indicators was tested against the 10.0 criterion and statements contributing to high levels of multicollinearity were removed until all VIFs in the construct fell below the specified criterion. To maintain content validity where possible, a representative item from each of the components of the PCA analyses was retained in the construct.
3. Risky Practices was originally conceptualized as a single construct comprised of twelve statements. When we examined endorsement rates, i.e., the number of players selecting the item, a large range in endorsement levels were determined. The nature of the statements being endorsed suggested these items would be better

Table 2
Selection Criteria and Descriptive Statistics for the Formative Constructs

FLAGS-EGM Formative Constructs and Statements	Component	Component loading	Frequency Endorsed	Freq. Rank	T-Score for Coefficients	Variance Inflation Factor
Erroneous Cognitions Beliefs						
Belief1: You can sometimes tell when the machine is about to pay out big because the symbols start getting closer to lining up on the line (e.g., almost winning).	1	0.53	6.4%	92	4.67	1.10
Belief2: I feel the machines are fixed sometimes so that you can't win on them.	2	0.81	67.6%	1	2.10	1.03
Belief3: It is important for me to use a system or a strategy when I play the machines.	3	0.80	9.9%	74	1.59	1.06
Belief4: I believe that in the long run I can win playing slots at the casino.	4	0.68	5.9%	97	3.35	1.04
Belief5: If a slot machine hasn't had a big pay out in a long time, it is more likely to do so soon.	5	0.75	25.4%	25	1.84	1.11
Erroneous Cognitions Motives						
Motive1: I sometimes play the slots in hopes of paying off my debts/bills.	6	0.65	11.0%	69	4.98	1.29
Motive2: Gambling on the slots is a way I can try to get some money when I need it.	6	0.74	6.1%	95	2.83	1.25
Motive3: I sometimes play the slots when I'm feeling down or depressed.	7	0.72	19.0%	44	5.58	1.32
Motive4: I can escape by playing the slots whenever I am worried or under stress	7	0.67	27.0%	18	2.29	1.23
Risky Behaviours Earlier						
RBE1:I sometimes exceed the amount of money I intended to spend in order to win back money I have lost.	8	0.77	29.7%	14	7.62	1.52
REB2: When gambling on the slots I usually use my bank or debit card to get more money so I can keep playing.	8	0.65	19.8%	42	4.74	1.58
RBE3: I play max bet if I'm on a winning streak.	9	0.76	29.7%	15	1.62	1.15

Table 2. Continued.

FLAGS-EGM Formative Constructs and Statements	Component	Component loading	Frequency Endorsed	Freq. Rank	T-Score for Coefficients	Variance Inflation Factor
RBE4: If I win big I am likely to put the money back into a machine and keep playing.	10	0.78	17.6%	50	4.73	1.34
RBE5: When gambling on a slot machine I usually play as fast as I can.	11	0.76	15.0%	57	2.48	1.17
RBE6: I have sometimes gambled for more than six hours straight when I was playing the slots.	12	0.63	34.8%	11	2.21	1.24
Risky Behaviours Later						
RBL1: After losing more money than I wanted on the slots I usually try to win it back by playing again either later that day or on another day.	13	0.71	14.7%	58	2.57	1.63
RBL2: When gambling on the slots I usually use my credit card to get more money so I can keep playing.	13	0.51	10.7%	71	3.25	1.37
RBL3: When I gamble with friends or family I sometimes stay and continue to play after they have stopped or left.	13	0.51	8.0%	84	3.40	1.64
RBL4: I have sometimes borrowed money from others so I could go and gamble on the slots.	14	0.85	4.3%	110	0.46	1.75
RBL5: I have borrowed money from other people at the casino in order to continue gambling.	14	0.73	4.0%	112	2.11	1.84
RBL6: I have left the casino to get more money so I can come back and keep on gambling.	14	0.48	7.8%	88	2.61	1.60
Negative Consequences						
NegCons1: My goals in life have been jeopardized by my slot play.	15	.58	4.8%	105	2.40	2.49
NegCons2: I often can't sleep because I am worrying about my slot machine gambling.	15	.73	2.9%	116	1.20	2.08

Table 2. Continued.

FLAGS-EGM Formative Constructs and Statements	Component	Component loading	Frequency Endorsed	Freq. Rank	T-Score for Coefficients	Variance Inflation Factor
NegCons3: I have had problems paying off debts accumulated from playing the slots.	15	.78	5.1%	102	0.36	2.79
NegCons4: Since I started playing the slots I don't like the type of person I have become.	15	.63	3.7%	114	0.15	2.29
NegCons5: Sometimes I have to juggle money and bills to cover the cost of my slot machine gambling.	15	.77	5.9%	98	3.31	2.71
NegCons6: I wouldn't want anyone to know how much time or money I spend at the casino.	16	.54	14.4%	61	2.43	1.63
NegCons7: Sometimes I feel depressed over my slots play.	16	.54	13.1%	62	3.78	1.74
NegCons8: Others are disappointed in me because of my gambling.	17	.68	5.1%	101	2.09	1.62
NegCons9: I have friends or family who are concerned about my slots play.	17	.76	5.1%	103	0.89	1.49
NegCons10: I have sometimes missed events or neglected family, friends or work in order to play the slots.	18	.72	2.7%	118	1.50	2.09
NegCons11: When I leave the casino, I have sometimes been short of cash for parking, food, or a ride home.	18	.78	1.6%	122	0.00	2.15
NegCons12: I have become somewhat of a loner because of my slot gambling.	19	.59	1.6%	125	0.00	1.80
NegCons13: I sometimes have spent time gambling on the slots when I was supposed to be doing something else important.	19	.59	5.6%	99	1.20	1.59
NegCons14: My gambling has caused me to have a falling out with the people I used to hang out with.	20	.88	1.6%	121	0.81	1.26

Table 3
Reliability Measures for Reflective Constructs

Reflective Construct	Average Variance Extracted (AVE)	Composite Reliability
Preoccupation Desire	0.64	0.88
Preoccupation Obsessed	0.68	NA
Impaired Control Begin	0.75	0.90
Impaired Control Continue	0.70	0.92
Persistence	0.69	0.90

represented under two separate categories, Risky Practices Earlier and Risky Practices Later. For Risky Practices Earlier, six statements had relatively high endorsement rates, equal to or above 15%. Those statements dealt, for the most part, with playing style, such as playing max bet if the gambler is on a winning streak; obtaining more money from existing funds, such as using a debit card; and chasing losses during a play session rather than between sessions. The statements assigned to Risky Practices Later were endorsed by fewer than 15% of the respondents (see Table 2), suggesting that these behaviours were less common than those behaviours associated with Risky Practices Earlier, and thus more likely to be associated with higher risk. Four of the items addressed different ways to borrow money, including accumulating debt, one item concerned chasing losses between sessions, and one item asked about continuing a session of play even after family and friends depart.

Testing Statements for Validity and Reliability

Analyses for validity and reliability were conducted for the formative and reflective constructs using methods appropriate to the respective form of construct.

Construct Reliability and Convergent Validity for Reflective Constructs. The construct reliability for reflective constructs is shown in Table 3. An outcome of the statement selection process was that the Preoccupation Obsession construct had only two statements. This fact meant that reliability tests could not be performed in this instance. We left this two-statement construct in the analyses when testing the other constructs. The four constructs consisting of three or more statements all had component reliability above the recommended level of 0.70 (Nunnally, 1978), indicating sufficient internal consistency. The convergent validity was evaluated using the average variance extracted (AVE) and all five reflective constructs were found to perform above the guideline of 0.5 as recommended by Fornell and Larcker (1981).

Discriminant Validity Among Reflective Constructs. The discriminant validity of the five reflective constructs was evaluated using two approaches. The first approach compared the square root of the Average Variance Extracted (AVE) to the correlations of the other constructs. Adequate discriminant validity was indicated if the square root of the construct's AVE was greater than its correlations with the other constructs (Compeau, Higgins, & Huff, 1999). Table 4 presents the square root of the AVE in the diagonal and the correlations in the off diagonal. All five reflective constructs passed the

Table 4
Square Root of AVE and Inter-construct Correlations to Test for Divergent Validity

	Erroneous Cognitions Beliefs	Preoccupation Desire	Risky Practices Earlier	Impaired Control Continue	Erroneous Cognitions Motives	Preoccupation Obsessed	Impaired Control Begin	Risky Practices Later	Negative Consequences	Persistence
Risky Cognitions Beliefs	na									
Preoccupation Desire	0.40	0.80								
Risky Practices Earlier	0.43	0.54	na							
Impaired Control Continue	0.36	0.64	0.76	0.84						
Risky Cognitions Motives	0.49	0.39	0.58	0.53	na					
Preoccupation Obsessed	0.50	0.44	0.50	0.52	0.55	0.83				
Impaired Control Begin	0.40	0.41	0.59	0.61	0.48	0.50	0.87			
Risky Practices Later	0.45	0.48	0.67	0.60	0.59	0.61	0.66	na		
Negative Consequences	0.44	0.40	0.61	0.59	0.62	0.56	0.70	0.74	na	
Persistence	0.47	0.44	0.65	0.67	0.63	0.63	0.73	0.75	0.81	0.83

Table 5
Component Loadings on Constructs to Measure Discriminant Validity of Reflective Constructs

Statements	Constructs									
	Preoccupation Desire	Preoccupation Obsessed	Impaired Control Continue	Impaired Control Begin	Persistence	Risky Cognitions Beliefs	Risky Cognitions Motives	Risky Practices Earlier	Risky Practices Later	Negative Consequences
Pre-des1	**0.84**	0.34	0.54	0.33	0.37	0.30	0.36	0.44	0.39	0.34
Pre-des2	**0.72**	0.25	0.43	0.26	0.29	0.28	0.24	0.42	0.29	0.23
Pre-des3	**0.81**	0.40	0.50	0.39	0.39	0.33	0.35	0.47	0.42	0.37
Pre-des4	**0.82**	0.39	0.55	0.31	0.35	0.24	0.29	0.39	0.41	0.31
Pre-obs1	0.25	**0.74**	0.28	0.27	0.37	0.36	0.38	0.29	0.42	0.40
Pre-obs2	0.44	**0.90**	0.53	0.52	0.63	0.45	0.52	0.50	0.57	0.51
IC-cont1	0.59	0.42	**0.89**	0.52	0.58	0.31	0.45	0.68	0.54	0.46
IC-cont2	0.57	0.41	**0.87**	0.49	0.55	0.29	0.44	0.69	0.53	0.49
IC-cont3	0.49	0.46	**0.81**	0.49	0.60	0.29	0.43	0.62	0.51	0.54
IC-cont4	0.50	0.46	**0.83**	0.55	0.57	0.33	0.46	0.63	0.52	0.50
IC-cont5	0.53	0.43	**0.79**	0.53	0.51	0.30	0.45	0.58	0.42	0.47
IC-begin1	0.38	0.46	0.54	**0.91**	0.65	0.35	0.38	0.55	0.62	0.67
IC-begin2	0.32	0.48	0.55	**0.89**	0.66	0.36	0.44	0.49	0.59	0.61
IC-begin3	0.36	0.35	0.51	**0.80**	0.58	0.33	0.42	0.51	0.48	0.54
Persist1	0.39	0.54	0.61	0.66	**0.89**	0.40	0.56	0.58	0.63	0.74
Persist2	0.39	0.52	0.58	0.57	**0.84**	0.37	0.49	0.59	0.63	0.64
Persist3	0.32	0.54	0.47	0.61	**0.81**	0.44	0.56	0.45	0.62	0.66
Persist4	0.37	0.48	0.56	0.58	**0.79**	0.36	0.47	0.53	0.63	0.65

Table 6
Nomological Validity of Formative Constructs: Significant and Hypothesised Links in PLS Model

Link	Weight	T-Score
Risky Cognitions Beliefs → Risky Cognitions Motives	0.493	7.70
Risky Cognitions Motives → Risky Practices Earlier	0.205	3.92
Risky Cognitions Motives → Risky Practices Later	0.156	2.64
Risky Practices Earlier → Risky Practices Later	0.286	3.97
Risky Practices Later → Negative Consequences	0.494	6.56
Negative Consequences → Persistence	0.569	9.21

test for discriminant validity. For formative constructs, it is inappropriate to report AVE and not applicable (n.a.) has therefore been entered in the diagonal for these constructs.

The second approach (Gefen & Straub, 2005) compared the correlations between the individual items and the PLS calculated latent variable scores generated by conducting confirmatory factor analysis (Table 5). For the construct to have discriminant validity the item loadings for the reflective construct must be greater by 0.10 than the construct's correlations with the other items. The five reflective constructs passed the test for discriminant validity. Again, this test does not apply to formative constructs (Diamantopoulos & Winklhofer, 2001) as the items comprising such a construct are not expected to be correlated with each other. The formative constructs were retained in the table so that correlations with the tested reflective constructs can be evaluated.

Validity for Formative Constructs. We adopted the four methods recommended by Henseler, Ringle, and Sinkovics (2009, p. 309) for assessing the validity of formative constructs. 1. Nomological validity: The relationships between the formative index and other constructs in the path model, which are sufficiently well-known through prior research, should be strong and significant. 2. External validity: The formative index should explain the variance of an alternative reflective measure of the focal construct. 3. Significance of weights: Estimated weights of formative measurement models should be significant. 4. Multicollinearity: Manifest variables in a formative block should be tested for multicollinearity. The variance inflation factor (VIF) can be used for such tests. As noted previously, a VIF greater than 10.0 indicates the presence of harmful collinearity (Diamantopoulos & Siguaw, 2006).

Nomological validity. In the companion article to this paper, we created a Structural Equation Model using PLS (SEM PLS); we have reserved discussion of PLS and our hypotheses for that article. To describe the nomological validity of the constructs, however, we have reported principal results in Table 6. All five formative constructs predicted another construct as hypothesized, i.e., each had significant SEM PLS coefficients and four formative constructs were sequentially connected to preceding constructs as hypothesised.

External validity. To determine if the formative construct could explain a significant portion of the variance in an alternative but similar reflective measure of the construct,

we undertook such a comparison for Negative Consequences and Persistence, the latter being a reflective measure that has negative consequences as part of its makeup. The weight for this connection in the PLS model was 0.569 (t=9.21), supporting its validity. This test was not viable for the other formative constructs as equivalent reflective constructs were not available.

Significance of weights. The t-scores of the construct item weights for each of the formative constructs are found in Table 2. As recommended by Henseler et al. (2009), we retained certain non-significant indicators if they had sufficiently low VIF scores and were judged to be conceptually correct.

Multicollinearity. The statement selection process for formative constructs eliminated statements in each construct until all statements in the construct had VIF scores below 10.0 (Diamantopoulos & Siguaw, 2006; Henseler et al., 2009). We reported here the resulting range of VIF scores for each formative construct. The highest VIF score for Risky Cognitions Beliefs was 1.11 and for Risky Cognitions Motives 1.32. These scores indicate that multicollinearity was not an issue for either of these constructs. Both Risky Practices Earlier with a maximum VIF of 1.58 and Risky Practices Later with a maximum VIF of 1.84 had some degree of multicollinearity, but they were still well below the accepted threshold of 10 for inclusion in a formative construct. Similarly, Negative Consequences, with a maximumVIF score of 2.79, had some multicollinearity but again still met the criterion.

Testing for Common Method Bias

The data were examined for Common Method Bias using the method recommended by Podsakoff, MacKenzie, Lee, & Podsakoff (2003) for Harmon's one-factor test. PCA was performed on all 53 indicators chosen for inclusion in the constructs, and the unrotated solution was assessed to determine the number of components with an eigenvalue greater than one. Strong method bias is present if the analysis produces a single component; less bias is present when more components are produced. In the current analysis, eleven components emerged with eigenvalues greater than one with the first component accounting for 33.6% of the variance and, collectively, the 11 other components accounting for 66.3% of the original variance. The results supported the conclusion that the amount of variance because of common method bias was not sufficient to explain our findings.

Discussion

The results of testing and analysis produced an instrument with 53 statements comprising five formative and four reflective constructs designed to identify individuals experiencing risk of harm from gambling. A fifth reflective construct, Preoccupation Obsession, needs further development and testing to be an accurate measure of risk. The five formative constructs—Risky Cognitions Beliefs, Risky Cognitions Motives, Risky Practices Earlier, Risky Practices Later and Negative Consequences—passed the tests for nomological validity and external validity. The

majority of the items had significant regression weights and any other statements retained were theoretically valid. All of the items passed the test for multicollinearity with VIF scores significantly below 10.0 and none greater than 2.8. The hypothesized relationships found in the PLS analysis are described in the companion paper as well as the potential applications for the FLAGS-EGM instrument.

The formative construct Risky Practices was divided into two constructs as some behaviours were found to be quite commonly endorsed by more gamblers whereas others were less frequent and more likely to be exhibited by those at higher risk, i.e., located closer to problem gambling status. As a result, the construct was subdivided to identify those exhibiting behaviour either early or late in the process of becoming a problem gambler. Using two constructs to define operationally early and late risk practices should provide a superior model of risk factors associated with problem gambling, in particular in terms of positioning, such constructs in the hierarchy of risk for problem gambling, e.g., earlier versus later risk factors.

Because FLAGS-EGM is composed of separate distinctive constructs we were able to focus on creating highly accurate statements to capture the essence of each specific variable. As a result, when designing the Negative Consequence construct, we could separate cause from effect, an important temporal consideration when designing an instrument for prevention applications. For example, borrowing money to gamble is not a negative consequence of gambling as consumers borrow money regularly for many purchases. Not being able to repay the loans or having to sacrifice other needed resources to pay for these loans, however, would be a negative consequence that could result from borrowing.

Some investigators consider obsession with gambling as a negative outcome that should be included as part of the definition of problem gambling rather than as a risk factor. We understand that obsession is closely related to problem gambling, but question whether on its own obsession is sufficient to define problem gambling. Many individuals can be obsessed with activities but in and of itself, this characteristic may in fact not be linked to negative consequences for an individual. For example, if an individual is obsessed with playing golf there may in fact be no negative impacts unless that person begins to miss work or neglect family responsibilities. We believe that if gamblers have become obsessed with gambling but have yet to suffer negative consequences, such a situation may accordingly be an excellent indicator of high-risk due to gambling. If further investigation indicates that only problem gamblers exhibit obsession with gambling, then we would reject the construct as a useful risk predictor.

The use of formative constructs should provide users of FLAGS-EGM added insight into the nature of the harms or risk factors gamblers face. For example, the gambler who self-administers the instrument can see which specific behaviours may be contributing to their risk and may be able to curtail or self-manage these behaviours. Public health, regulatory bodies and treatment providers will all be able to judge the degree to which problem gamblers suffer financial, relationship, or psychological harm and in turn, influence policy and practices. Even more importantly from a prevention

and harm reduction perspective, it will be possible to assess the respective impacts of specific actions undertaken to resolve or mitigate risk for problem gambling, a means of measurement and evaluation that is not possible using existing screens.

Factor analysis and the literature supported the hypothesis that two of the reflective constructs, Preoccupation and Impaired Control, should each be subdivided into two separate constructs, Preoccupation Desire and Preoccupation Obsession, and Impaired Control Begin and Impaired Control Continue, respectively. Subsequent testing for discriminant validity confirmed that they are four distinct constructs. Four of the five reflective measures: Impaired Control Continue, Impaired Control Begin, Persistence, and Preoccupation Desire were each shown to hold sufficient internal consistency with component reliabilities above 0.70 and convergent validity with AVE scores above 0.5. Moreover, they each had discriminant validity, all having a greater square root of the Average Variance Extracted compared to the correlations with the other constructs. Moreover, the PLS-calculated latent variable scores for the reflective constructs were greater by 0.10 than the construct's correlations with the other items.

The constructs were designed using a sample of regular Ontario slot gamblers. It could be argued that this restriction accordingly limits the generalizability of the results; however, we believe this limitation could apply to any set of constructs based on a single sample representing a specific population. The original items comprising FLAGS-EGM were developed and tested with video lottery players in Nova Scotia, Canada, and 'pokie' machine gamblers in Victoria, Australia. We did not use samples of university students, self-selected samples, or volunteers recruited through advertisements. Individuals diagnosed with comorbid disorders, treatment populations or prison inmates were not surveyed. Consequently, we are confident that these results are reasonably reflective of a general population of gamblers.

The item scales are dichotomous (yes/no) to facilitate understanding and ease of answering the items, a desirable characteristic for an instrument that is designed to be self-administered and which is composed of a large number of items. Examination of other screens suggests that it is difficult to create multi-item scales without adding considerable method bias as a result of the misfit between the statement and the scale anchors. Moreover, we built frequency distinctions into the statements to account for differences in the occurrence of certain behaviours, beliefs or outcomes. Certain statistics, particularly factor analysis, may be somewhat inaccurate when applied to dichotomous data. For example, on average, the loading may vary $\pm$ 0.08 compared to statistics derived using other techniques (Maguire 2001). Although we used PCA analysis to nominate statements for inclusion in the constructs, we relied on other means to actually test the reliability and validity of the constructs. As a result, we believe the use of factor analysis in this context does not reduce the validity of the constructs.

The current process did not yield a usable construct to measure Preoccupation Obsession. In the next phase of the research, additional statements will be included and tested to capture better this latent variable.

FLAGS-EGM holds strong potential. This approach to risk measurement moves beyond simple identification of those persons who have problems to active risk tracking for prevention and evaluation purposes. We will be conducting further research to develop this instrument by applying it to other larger, random samples of EGM players in different markets, testing new candidate statements for the preoccupation construct and retesting the constructs for reliability and validity.

The next steps, as detailed in the companion paper in this issue, required the use of SEM PLS to determine the causal paths of the relationships among the constructs. The placement and grouping of the constructs as indicators of risk will then determine the appropriate number of risk levels to create. FLAGS-EGM is composed of separate construct measures of risk, and thus when compared with current instruments, it should more accurate assess an individual's risk due to gambling as well as identify those.

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Appendix

FLAGS-EGM

Risky Cognitions Beliefs

- You can sometimes tell when the machine is about to pay out big because the symbols start getting closer to lining up on the pay line (e.g., almost winning).
- I feel the machines are fixed sometimes so that you can't win on them.
- It is important for me to use a system or a strategy when I play the machines.
- I believe that in the long run I can win playing slots at the casino.
- If a slot machine hasn't had a big pay out in a long time, it is more likely to do so soon.

Risky Cognitions Motives

- I sometimes play the slots in hopes of paying off my debts/bills.
- I sometimes play the slots when I'm feeling down or depressed.

- Gambling on the slots is a way I can try to get some money when I need it.
- I can escape by playing the slots whenever I am worried or under stress.

Preoccupation Desire

- If I could play the machines all the time I would.
- I wish I could gamble on the slots more often.
- I would like to play the slots almost every day.
- I like to play the slot machines every chance I get.

Preoccupation Obsession

- I sometimes dream about playing the slot machines.
- I spend more time than I used to thinking about playing the slots.

Risky Practices Earlier

- I sometimes exceed the amount of money I intended to spend in order to win back money I have lost.
- When gambling on the slots I usually use my bank or debit card to get more money so I can keep playing.
- I play max bet if I'm on a winning streak.
- If I win big I am likely to put the money back into a machine and keep playing.
- When gambling on a slot machine I usually play as fast as I can.
- I have sometimes gambled for more than six hours straight when I was playing the slots.

Risky Practices Later

- After losing more money than I wanted on the slots I usually try to win it back by playing again either later that day or on another day.
- When gambling on the slots I usually use my credit card to get more money so I can keep playing.
- When I gamble with friends or family I sometimes stay and continue to play after they have stopped or left.
- I have sometimes borrowed money so I could go and gamble on the slots.
- I have borrowed money from other people at the casino in order to continue gambling.
- I have left the casino to get more money so I can come back and keep on gambling.

Impaired Control Continue

- I often spend more money gambling than I intended.
- Even when I intend to spend a few dollars gambling, I often end up spending much more.
- I sometimes gamble with money that I can't really afford to lose.
- Once I have started gambling on the slots I find it very hard to stop.
- I often spend more time gambling than I intend to.
- Impaired Control Begin

- I have tried to cut back on my slots play with little success.
- I have tried unsuccessfully to stop or reduce my gambling on the slots.
- There have been times I have gambled despite my desire not to.

Negative Consequences

- My goals in life have been jeopardized by my slot play.
- I often can't sleep because I am worrying about my slot machine gambling.
- have had problems paying off debts accumulated from playing the slots.
- Since I started playing the slots I don't like the type of person I have become.
- Sometimes I have to juggle money and bills to cover the cost of my slot machine gambling.
- I wouldn't want anyone to know how much time or money I spend at the casino.
- Sometimes I feel depressed over my slots play.
- Others are disappointed in me because of my gambling.
- I have friends or family who are concerned about my slots play.
- I have sometimes missed events or neglected family, friends or work in order to play the slots.
- When I leave the casino, I have sometimes been short of cash for parking, food, or a ride home.
- I have become somewhat of a loner because of my slot gambling.
- I sometimes have spent time gambling on the slots when I was supposed to be doing something else important.
- My gambling has caused me to have a falling out with the people I used to hang out with.

Persistence

- I continue to play the machines despite experiencing problems or other negative consequences.
- I continue to gamble despite the bad things that happen to me.
- I gamble even though I know it is likely to lead to problems for me.
- Even if money is tight, I continue to play the slots to get big wins.

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For correspondence: Tony Schellinck, PhD, Focal Research Consultants Limited, 7071 Bayers Rd., Suite 326, Halifax, NS, Canada B3L 2C2. E-mail: tschellinck@focalresearch.com, Website address: http://www.focalresearch.com

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Dr. Tony Schellinck is an Adjunct Professor in the Faculty of Graduate Studies and the Rowe School of Business at Dalhousie University, Canada, as well as CEO of Focal Research Consultants Limited. From 1996 to 2013 he was the F. C. Manning Chair in Economics and Business at Dalhousie University. Since 1989 he has conducted research into gambling behaviour for industry, government, public health and regulatory agencies. This work included a ten-year large-scale monthly tracking study of gambling behaviour, over 300 focus group sessions with gamblers, the 1998 Nova Scotia Video Lottery Study, two large scale studies into the value of responsible gambling features on VLT machines, and the Nova Scotia Adolescent Gambling Exploratory Research: Identification of Risk and Gambling Harms Among Youth. Dr. Schellinck worked on creating the first algorithms deployed in casinos that identified using player loyalty data high-risk gamblers.

Ms. Tracy Schrans is Principal and President of Focal Research Consultants an independent research firm in Halifax, NS. Over the last twenty years Tracy has conducted numerous government, public health, and industry-sponsored research projects on a wide range of issues, with a particular emphasis on gambling- and alcohol-related issues. She consults internationally in responsible gambling and corporate social responsibility, social policy, player tracking and loyalty data analysis. Schrans is one of the developers of new instruments for measuring pre-harm risk for gambling among adults (FLAGS-EGM and FLAGS General) and adolescents (FYGRS) for prevention applications. She continues to work at the forefront of gambling behavior analytics, assisting gambling stakeholders in

using system data, measurement, and technology to help identify, manage and prevent gambling risk and harm among their customers.

Dr. Heather Schellinck, PhD, is an Adjunct Professor in the Faculty of Graduate Studies and Department of Psychology and Neuroscience at Dalhousie University. Her research is primarily focused on learning and memory in animal models of neurodegenerative disease.

Dr. Michael Bliemel is an associate professor of Management Information Systems at Dalhousie University in Halifax, NS. He completed his PhD at McMaster University in Management Science/Systems, specializing in the quantitative modeling of consumer behaviour with health information systems. His current research interests include the strategic management of information systems and innovation in organizations, and business intelligence applications.